

## Process Evaluation Section

# Upgrading Low-Btu Natural Gas Discoveries to Pipeline Quality Gas

### Problem/Opportunity

A large number of natural gas discoveries are not utilized because they contain substantial amounts of  $N_2$  and/or  $CO_2$  and therefore, they have low-Btu values and are not of commercial quality. These gas wells are capped and the gas is shut in the ground. However, if the inert gases can be separated from the natural gases, the Btu value of the gas can be upgraded to a pipeline or commercial quality value (~1000 Btu per standard cubic foot).

### Approach

We evaluated a hybrid-process method where two commercially available technologies, compression and cooling, and dissolution in selective solvents, were used in series to upgrade the natural gases more efficiently and at a lower cost. The integration of these two methods improved the heat transfer between the process streams, and therefore reduced the energy consumption of the process. We also investigated absorbents that selectively dissolve the organic hydrocarbon gases and leave behind the inorganic gases. We then simulated this hybrid process using the ASPEN PLUS © software code

which enabled us to conduct several iterations on the conceptual design and to conduct trade-off analyses.

### Results

We have identified and ranked several solvents that possess a higher affinity for hydrocarbon gases than for nitrogen and carbon dioxide. We have also developed conceptual designs for upgrading low-Btu gas sources that exist at different total pressures and compositions. We have identified potential improvements to the distillation column that will be used in the final purification of the commercial-quality product gas.

### Future Plans

The analytical methodology and computer simulations that we have developed and employed in this research can be readily applied to the separation of complex gas mixtures using combinations of techniques for separating gas mixtures, such as those encountered in the chemical, petroleum and petrochemicals industries.

ARGONNE HYBRID PROCESS  
FOR NATURAL GAS UPGRADE

